

ROYALOHM

C O N F I D E N T I A L D O C U M E N T

SPECIFICATION FOR APPROVAL

"Distributed by Conrad Electronic SE., Hirschau, Germany"

CONRAD

Description : Metal Oxide Film Fixed Resistors

Royalohm Part no.:

MOR01SJxxxxA10 (MOR 1W-S +/- 5% T/B-1,000 PT-52mm)

Approved by

Parts corresponding to RoHS Compliant: 2005-Apr.-1

Royal Electronic Factory (Thailand) Co., Ltd.

20/1-2 Moo 2 Klong-Na, Muang

Chachoengsao 24000, Thailand

Tel: +66-38-822404-8

Fax: +66 38-981190 / 823765

E-mail Address: Export sales: Export@royalohm.com

Local sales: Local@royalohm.com

<http://www.royalohm.com>

P.O. Box 251 Klongchan, Bangkok 10240, Thailand

Approved	Checked	Prepared
Mr. Jack Lin	Mr. S. Polthanasan	Ms. P. Supatta

Issue Date: 2014/10/29

Customer: CONRAD

Part No.: MOR01SJxxxxA10

1. Scope:

This specification for approval relates to Metal Oxide Film Fixed Resistors manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form :

(Ex.) $\frac{\text{MOR}}{\text{Type}}$ $\frac{\text{1W-S}}{\text{Power Rating}}$ $\frac{\text{J}}{\text{Resistance Tolerance}}$ $\frac{\text{10}\Omega}{\text{Nominal Resistance}}$

3. Ratings:

Ratings shall be shown in the table 1.

Table 1

Type	MOR
Rated Power	1W at 70°C
Max. Working Voltage	350 V
Max. Overload Voltage	600 V
Dielectric Withstanding Voltage	350 V
Rated Ambient Temp.	70 °C
Operating Temp.Range	-55°C --- +130°C
Resistance Tolerance	± 5 %
Resistance Range	1Ω ~ 50KΩ

3.1 Power rating:

Resistors shall have a power rating based on continuous full load operation at an ambient temperature of 70 °C . For temperature in excess of 70 °C , the load shall be derated as shown in the figure 1.

3.2 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating , as determined from the following formula :

$$RCWV = \sqrt{P \times R}$$

Were : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

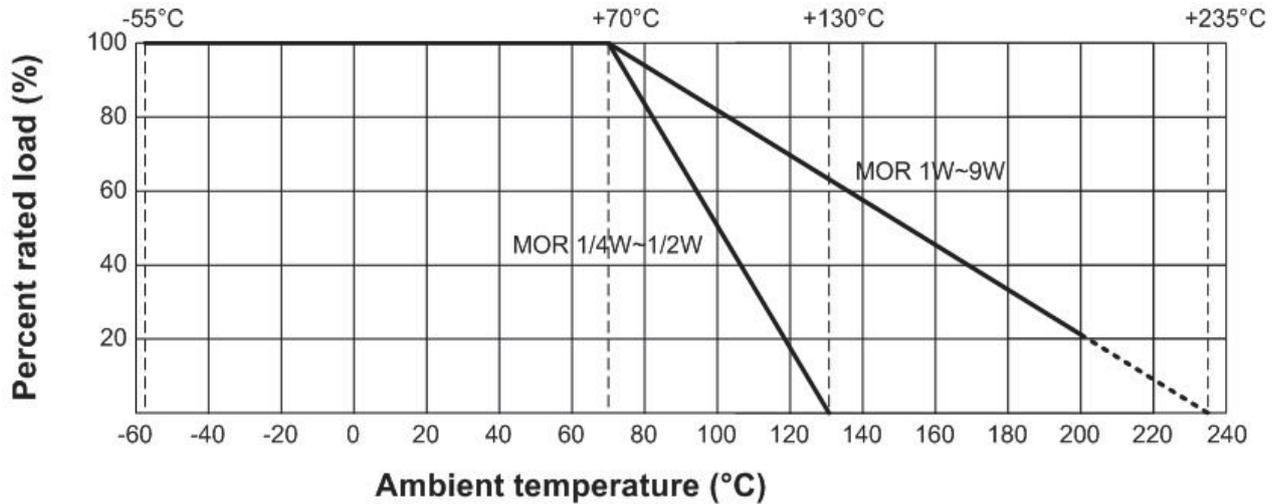
P = Power Rating (watt)

R = Nominal Resistance (ohm)

Metal Oxide Film Fixed Resistors

In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value

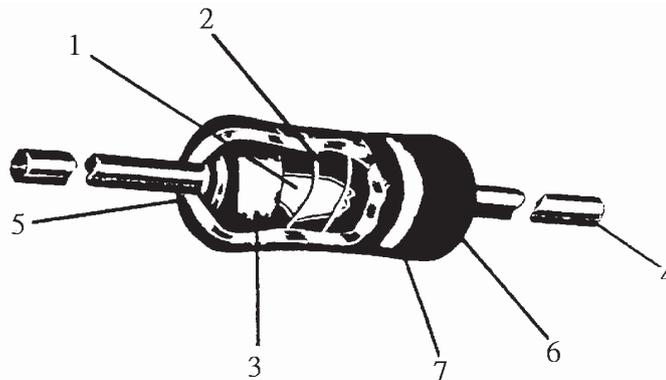
Figure 1.



3.3 Nominal resistance :

Effective figures of nominal resistance shall be in accordance with E-96 series, and resistance tolerance shall be shown by table 1.

4. Construction :



No.	Name	Material
1	Basic Body	Rod Type Ceramics
2	Resistance Film	$0.1\Omega \leq R \leq 12\Omega$: CNP film
		$12.1\Omega \leq R \leq 100k\Omega$: Metal oxide film
		$R > 100k\Omega$: Carbon film
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire coated with tin
5	Joint	By welding
6	Coating	Insulated & Non-Flame Paint (Color : Sea-Blue)
7	Color Code	Non-Flame epoxy resin

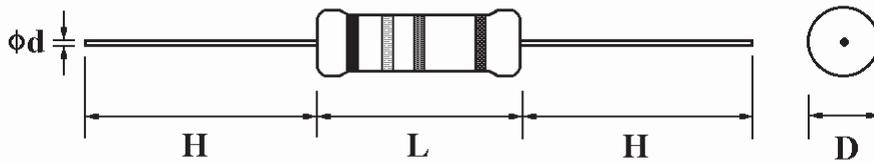
Metal Oxide Film Fixed Resistors		
5. Characteristics :		
Characteristics	Limits	Test Methods (JIS C 5201-1)
DC. resistance	Must be within the specified tolerance	The limit of error of measuring apparatus shall not exceed allowable range or 1% of resistance tolerance (Sub-clause 4.5)
Insulation resistance	Insulation resistance is 20 MΩ Min	Resistors shall be clamped in the trough of a 90° metallic V-block or foil method use a metal foil shall be wrapped closely around the body of the resistor. After that shall be tested at DC potential respectively specified in the above list for 60 +10/-0 secs. (Sub-clause 4.6)
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down	Resistors shall be clamped in the trough of a 90° metallic V-block or foil method use a metal foil shall be wrapped closely around the body of the resistor. After that shall be tested at AC potential respectively specified in the table 1. for 60 +10/-0 secs. (Sub-clause 4.7)
Temperature coefficient		Natural resistance change per temp. degree centigrade.
	Resis.Range	T.C.R. (PPM/°C)
	0.1Ω ~ 12Ω	±200
	12.1Ω ~ 100K	±350
	101K ~ 1M	-700
	1.1M ~ 10M	-1500
		$\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \quad (\text{PPM}/^\circ\text{C})$ R1: Resistance value at room temperature (t1) R2: Resistance value at room temp. plus 100 °C (t2) (Sub-clause 4.8)
Short time overload	Resistance change rate is ± (2% + 0.05 Ω) Max. with no evidence of mechanical damage	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds
Terminal strength	With no evidence of mechanical damage	Direct load : Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads Twist test : Terminal leads shall be bent through 90 ° at point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations (Sub-clause 4.16)
Solderability	95 % coverage Min.	The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes. Test temp. of solder : 245°C ± 3°C Dwell time in solder : 2 ~ 3 seconds (Sub-clause 4.17)

Metal Oxide Film Fixed Resistors																	
Characteristics	Limits	Test Methods (JIS C 5201-1)															
Temperature cycling	Resistance change rate is $\pm (2\% + 0.05 \Omega)$ Max. with no evidence of mechanical damage	4.19 Resistance change after continuous 5 cycles for duty cycle specified below:															
		<table border="1"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$</td> <td>30 mins</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>10~15 mins</td> </tr> <tr> <td>3</td> <td>$+155^{\circ}\text{C} \pm 2^{\circ}\text{C}$</td> <td>30 mins</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>10~15 mins</td> </tr> </tbody> </table>	Step	Temperature	Time	1	$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$	30 mins	2	Room temp.	10~15 mins	3	$+155^{\circ}\text{C} \pm 2^{\circ}\text{C}$	30 mins	4	Room temp.	10~15 mins
		Step	Temperature	Time													
		1	$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$	30 mins													
		2	Room temp.	10~15 mins													
3	$+155^{\circ}\text{C} \pm 2^{\circ}\text{C}$	30 mins															
4	Room temp.	10~15 mins															
Load life in humidity	<table border="1"> <thead> <tr> <th>Resistance value</th> <th>$\Delta R/R$</th> </tr> </thead> <tbody> <tr> <td>Less than 100K Ω</td> <td>$\pm 5\%$</td> </tr> <tr> <td>100K Ω or more</td> <td>$\pm 10\%$</td> </tr> </tbody> </table>	Resistance value	$\Delta R/R$	Less than 100K Ω	$\pm 5\%$	100K Ω or more	$\pm 10\%$	7.9 Resistance change after 1,000 hours (1.5 hours "on", 0.5 hour "off") at RCWV in a humidity chamber controlled at $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 90 to 95 % relative humidity									
	Resistance value	$\Delta R/R$															
	Less than 100K Ω	$\pm 5\%$															
100K Ω or more	$\pm 10\%$																
Load life	<table border="1"> <thead> <tr> <th>Resistance value</th> <th>$\Delta R/R$</th> </tr> </thead> <tbody> <tr> <td>Less than 100K Ω</td> <td>$\pm 5\%$</td> </tr> <tr> <td>100K Ω or more</td> <td>$\pm 10\%$</td> </tr> </tbody> </table>	Resistance value	$\Delta R/R$	Less than 100K Ω	$\pm 5\%$	100K Ω or more	$\pm 10\%$	4.25.1 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ambient									
	Resistance value	$\Delta R/R$															
	Less than 100K Ω	$\pm 5\%$															
100K Ω or more	$\pm 10\%$																
Pulse overload	Resistance change rate is $\pm (5\% + 0.05 \Omega)$ Max. with no evidence of mechanical damage	4.28 Resistance change after 10,000 cycles (1 second "on", 25 seconds "off") at 4 times RCWV or the max. pulse overload voltage															
Resistance to solvent	No deterioration of protective coatings and markings	4.29 Specimens shall be immersed in a bath of trichloroethylene completely for 3 minutes with ultrasonic															

Metal Oxide Film Fixed Resistors

6. Dimension :

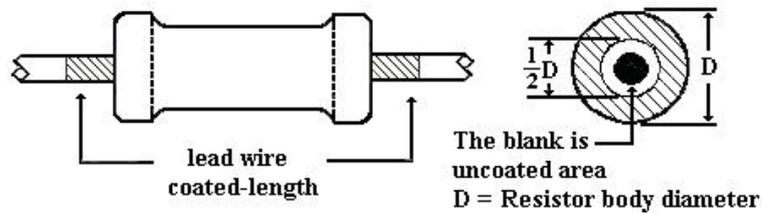
Unit : mm



Type	Power Rating	D (Max.)	L (Max.)	d ± 0.05	H ± 3
MOR	1W-S	3.5 mm	10.0 mm	0.54 mm	28 mm

Painting method:

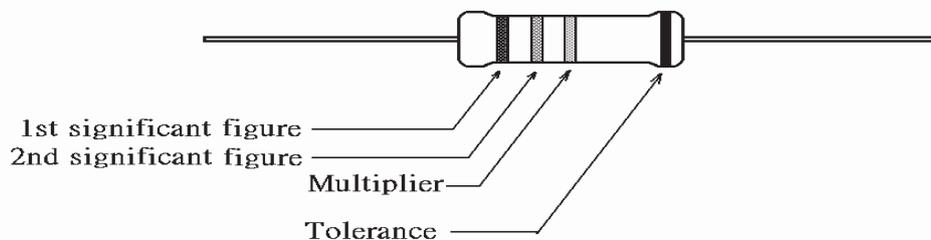
Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within 1/2 of the arc angle.



7. Marking :

7.1 Resistor :

Resistors shall be marked with color coding colors shall be in accordance with JIS C 0802



7.2 Label :

Label shall be marked with following items:

- (1) Type and style
- (2) Nominal resistance
- (3) Resistance tolerance
- (4) Quantity
- (5) Lot number
- (6) PPM

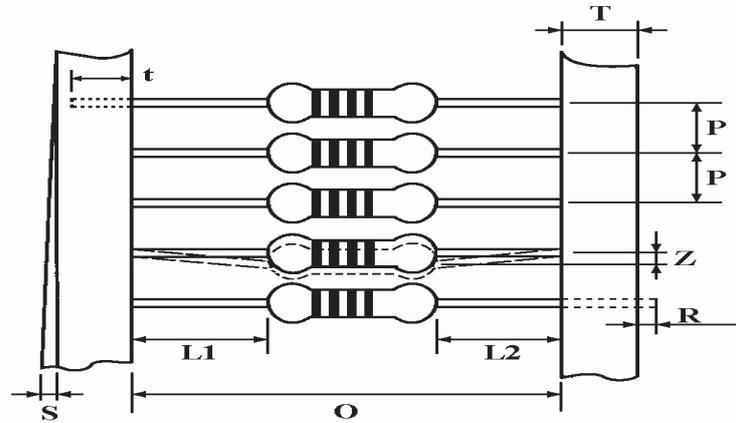
Example :

Metal Oxide Fixed Resistors			
Watt :	1W-S	Val :	10E
Q'TY :	1,000	Tol :	5%
Lot :	702312	PPM :	
	ROYALOHM		Pb Free

Metal Oxide Film Fixed Resistors

8. Packing specification :

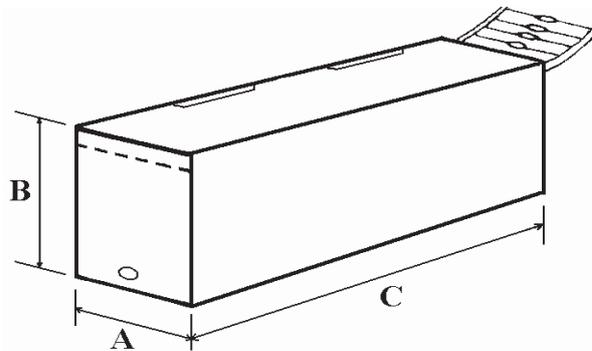
8.1 Taping dimension :



Dimensions (mm)

Type	Style	O	P	L1-L2	T	Z	R	t	S
MOR-100-S	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.

8.2 Tape in box packing :



Bandoliers may also be contained in a cardboard box ("Ammopack")

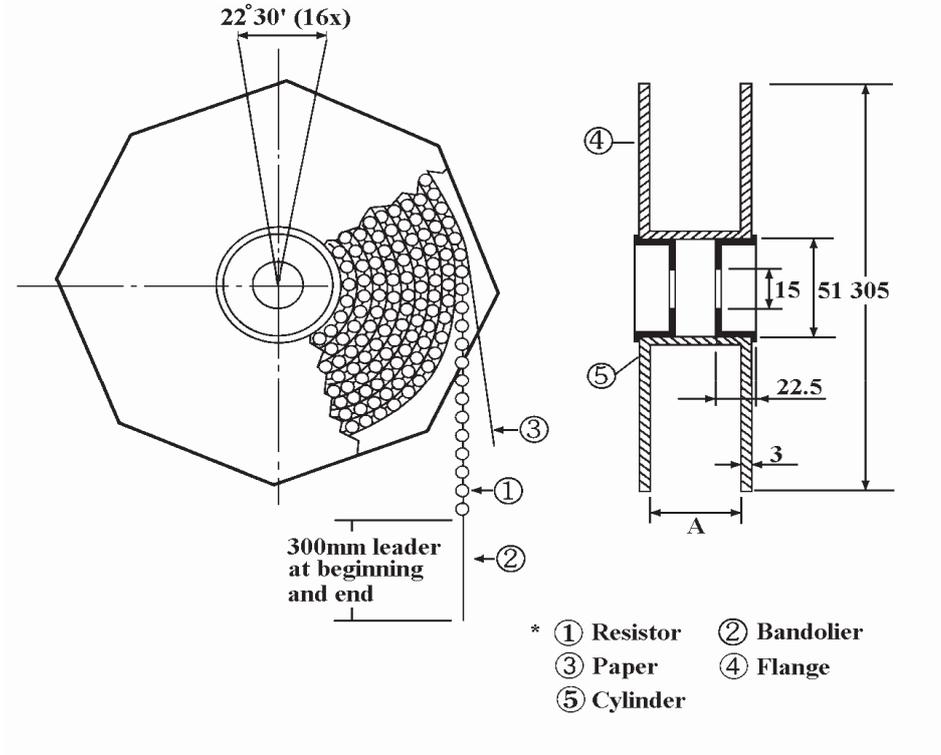
Dimension (mm)

Type	Style	L (C) ± 5	W (A) ± 5	H (B) ± 5	Quantity Per Box (pcs.)
MOR-100-S	PT-52	260	85	70	1,000

"Ammopack" is an abbreviation of "ammunition pack"

Metal Oxide Film Fixed Resistors

8.3 Tape on reel packing :



Dimension (mm) :

Type	Style	Across Flange (A)	Quantity Per Reel
MOR-100-S	PT-52	73 ± 2	2,500 pcs.

Part Number System

Explanation of Part Number System (Metal Oxide Film Fixed Resistors)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
M	O	R	0	1	S	J	0	1	0	0	A	1	0

Product Type:
MOR = Metal Oxide Film
Fixed Resistor

Special Feature:
0 = Standard Product
I = Non-Inductive Product

Tolerance:
G ~ ± 2%
J ~ ± 5%
K ~ ± 10%

Resistance Value:
E-24 series: the 1st digit is "0",
the 2nd & 3rd digits are for
the significant figures of the
resistance and the 4th indicate
the number of zeros following:
"J" ~ 0.1, "K" ~ 0.01
Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
E--96 Series: the 1st to 3rd digits
are significant figures of
resistance and the fourth
one denotes number of zeros
following:
Ex.: 1.33KΩ = 1331

Packing Quantity:
1 = 1,000pcs
2 = 2,000pcs
3 = 3,000pcs
4 = 4,000pcs
5 = 5,000pcs
A = 500pcs
B = 2,500pcs
0 = for Bulk/Box
packing

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box
P = Tape/Box of
PT-26mm

Wattage:

Normal size: W4 = 1/4W W2 = 1/2W 1W = 1W 2W = 2W 3W = 3W 5W = 5W 7W = 7W 8W = 8W 9W = 9W	Small size: S2 = 1/2W-S 1S = 1W-S 2S = 2W-S 3S = 3W-S 5S = 5W-S
--	---

Extra Small size:
5U = 5W-SS

Addition Information:
0 = PT-52mm, NIL for PT-26mm
8 = PT-58mm
9 = PT-64mm
7 = Lead wire(H) 38mm
A = PT-83mm
C = PT-73mm
D = PT-71mm

Sample: MO 1W-S +/- 5% 10Ω T/B 1,000 PT-52mm → MOR01SJ0100A10

Metal Oxide Film Fixed Resistors

Environment Related Substance

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and Halogen free.

Ozone layer depleting substances.

Ozone depleting substances are not used in our manufacturing process of this product.

This product is not manufactured using Chloro fluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.

Storage Condition

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and a relative humidity of $60\%RH \pm 10\%RH$

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2 , H_2S , NH_3 , SO_2 , or NO_2
2. In direct sunlight